FS-GM201
User’s Manual

Favite Inc.

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CHAPTER 1

Introduction

This Hardware Setup Guide provides instructions for installing and operating the FS-GM201 RFID Readers.
This document is designed for use by RFID system integrators and software developers - those who wish to develop software products and extended systems that take full advantage of the RFID Reader's capabilities.
Included with each reader or developer kit is the Favite RFID Reader Software Developer's Kit and User Documentation CD-ROM.

RFID Reader Overview

The Favite FS-GM201 RFID reader is designed to read and program any EPC Class 1 Generation 1 or 2 tag (see below) and issue event reports to a host computer system. The reader is also designed to read Class 0 tags and to read and program Class 1 tags. The host computer can be locally connected to the reader via USB, RS-232, or at a remote network location.
The RFID Reader is delivered with the following components and accessories:

- One(1)RFID Reader
- One(1)USB cable, or (1) RS-232 serial cable, or (1) Ethernet Cable (to connect to host computer)
- One (1) power supply and cord
- Favite RFID Reader Software Developer's Kit and User Documentation CD-ROM

EPC Class 1 UHF RFID Tags

The Favite FS-GM201 RFID reader is designed to read and program any EPC Class 1 Generation 1 or 2 tag (see below) and issue event reports to a host computer system. The reader is also designed to read and program Class 1 tags.
Class 1 tags are "passive" devices meaning they do not have a battery or other onboard power source. They are powered solely by the RF energy transmitted by an RFID reader.
They communicate with the reader through backscatter modulation in which the tags do not actually transmit RF energy. Instead, they change their reflective characteristics in a systematic way and reflect RF energy back to the reader. An analogy to this is the way you can use a mirror to transmit information by reflecting light from the Sun.
Favite Inc. manufactures user-programmable EPC Class 1 tags compliant with all key commercial and DoD mandates. Favite offers a variety of designs capable of delivering optimal performance worldwide, including Europe and Asia.
For more information about RFID tags from Favite Inc., please visit our website at http://rfid.favitete.com.

Requirements

To interface with the RFID Reader you will need the following:

A PC running Windows 98 or higher, with CD-ROM drive, an available USB port, or RS-232 serial port, or Ethernet connectivity

Standard 110/220 VAC 50/60 Hz Power supply and cord (included with reader)

Host software (Favite Gateway demo software or your own custom software)

Specifications

System	
Host Interface (Module)	USB/UART
Host Interface (Module with Housing)	USB; RS-232 (Option); LAN (Option)
Chipset	PHY: Impinj R1000 MAC: ATMEL AT91SAM7S-256
Operating Voltages	5.0V+/-5%
DC Power	1.2A @ 30dBm
Protocol	
RFID Protocol Support	EPC Class 1 Gen 2; ISO 18000-6C
Support EPC DRM	Yes
RF Features	
Frequency	US: 902 ~ 928MHz（FHSS） EU: 865 ~ 868MHz
Demodulation	ASK or PSK
Modulation Depth	90% nominal
Data Encoding	FM0 or Miller code
Bit Rate	250K (default for DRM) 40K~640Kbps (option)
TX Output power	5 ~ 30dBm in 1dB step
Antenna Type	Dual Mono-static or Single Bi-static(option)
Antenna connector	2 SMA connectors or 1 MHF connector
Regulatory and Environmental Compliance	
EMC certification	FCC, CE, NCC
Temperature Range	Operating: 0 ~ 55 degree C, Storage: -20 ~ 85 degree C
Humidity	10% ~ 85% Non-condensing
Software	
Driver	Windows XP / Linux
Mechanical (Module)	
Dimension	60mm x 40mm x 7 mm ± 0.25mm
Weight	21 g
Mechanical (Module with Housing)	
Dimension	76mm x 72mm x 29.8 mm ± 0.25mm
Weight	135 g

Table 1 - Specification of the FS-GM201

Mechanical: Reader Physical Size

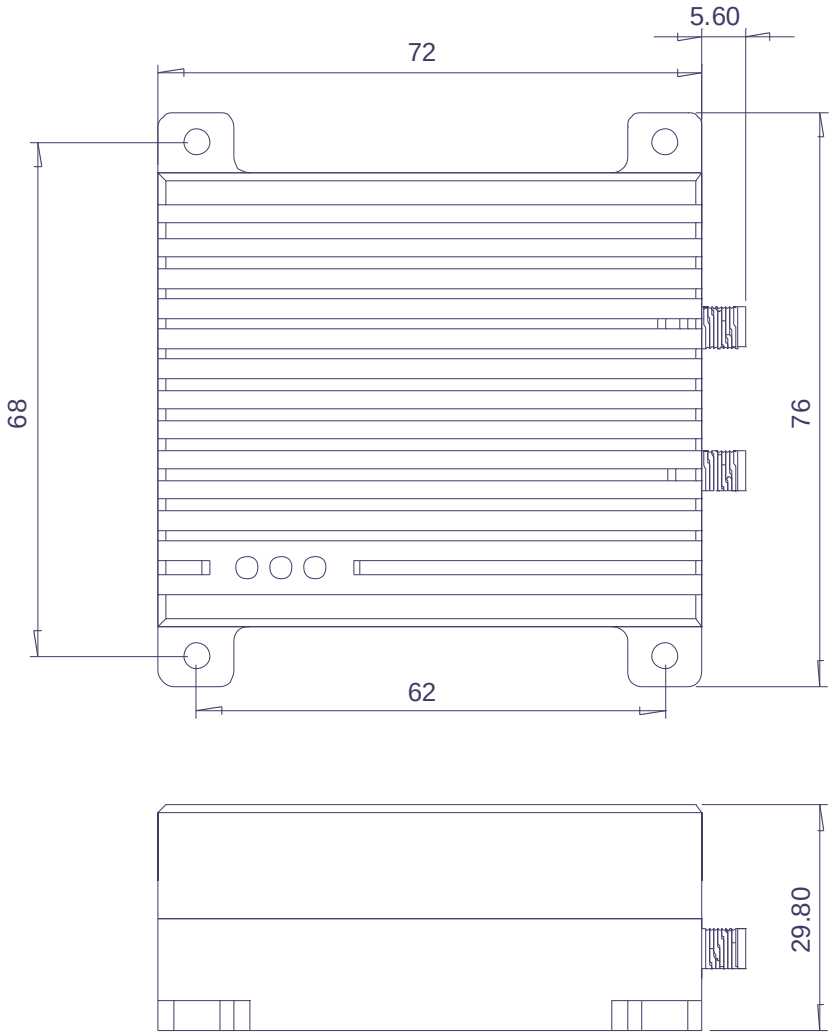


Figure 1 - Outline Drawing of the FS-GM201

USB Port Pinouts

Pin 1	5V VCC
Pin 2	Data+
Pin 3	Data-
Pin 4	Ground
Pin 5	Ground

Table 2 – Pin definition of the USB Port

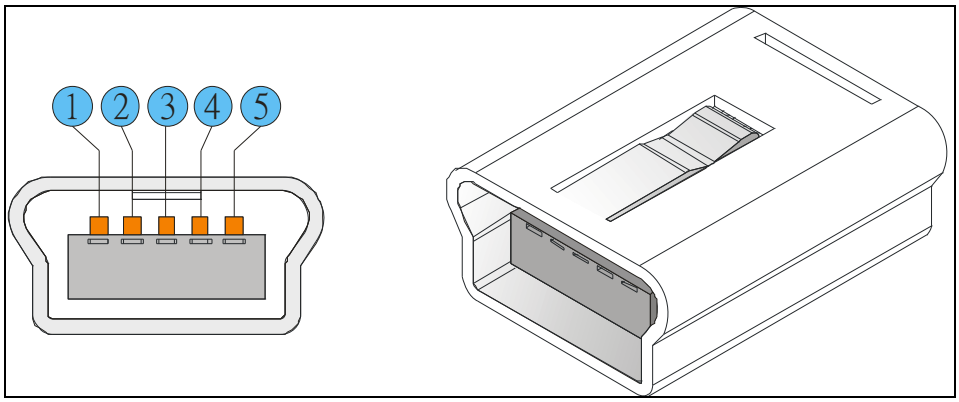


Figure 2 - USB CONNECTOR (Mini-USB, FEMALE) – LOOKING AT READER

RS-232 Port Pinouts

RS-232 Connector (Female DB-9F)

Pin 1	Not Available
Pin 2	TX
Pin 3	RX
Pin 4	Not Available
Pin 5	Ground

Table 3 – Pin definition of the RS232 Port

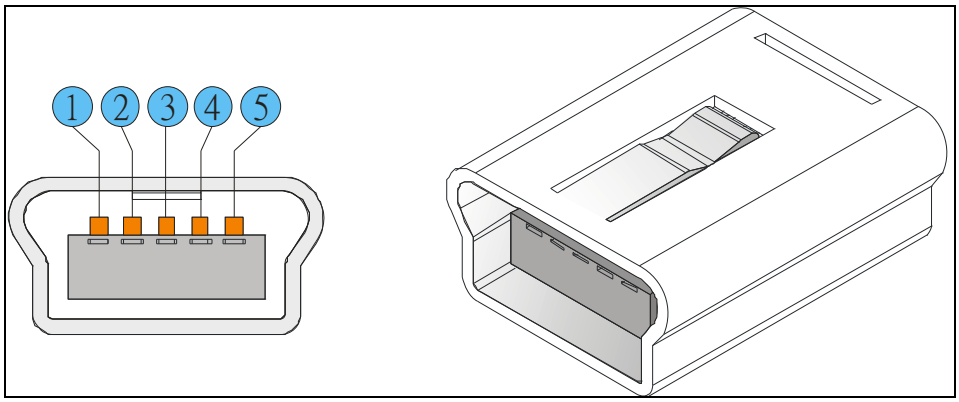


Figure 3 - RS-232 CONNECTOR (Mini-USB, FEMALE) – LOOKING AT READER

GPIO Port Terminal Interface

Pin 1	Ground A
Pin 2	Input 1
Pin 3	Ground B
Pin 4	Input 2
Pin 5	Output 1
Pin 6	VCC 1
Pin 7	Ground C
Pin 8	VCC 2
Pin 9	Ground D
Pin 10	Output 2

Table 4 – Pin definition of the GPIO

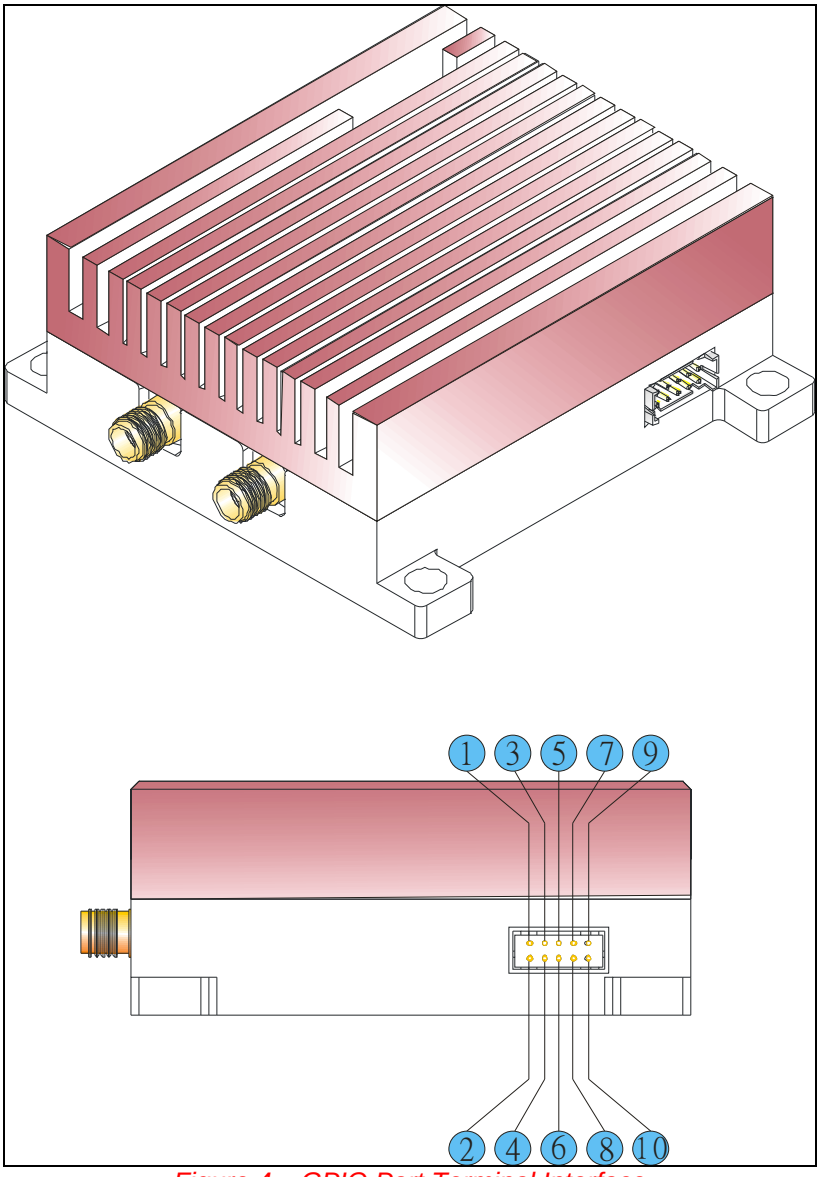


Figure 4 – GPIO Port Terminal Interface

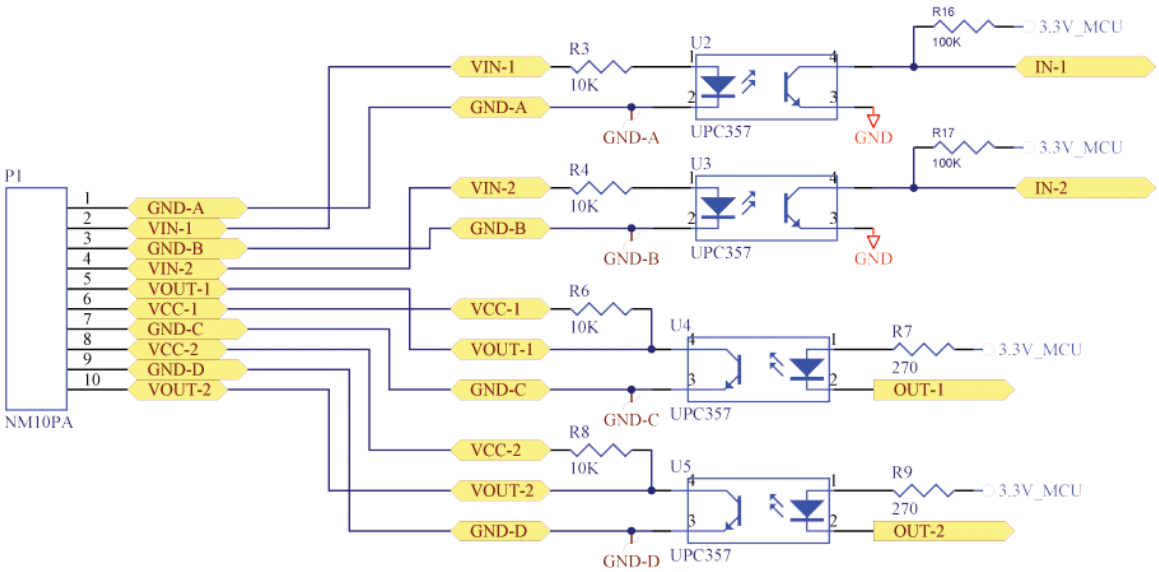


Figure 5 - GPIO Pin Circuit Diagram

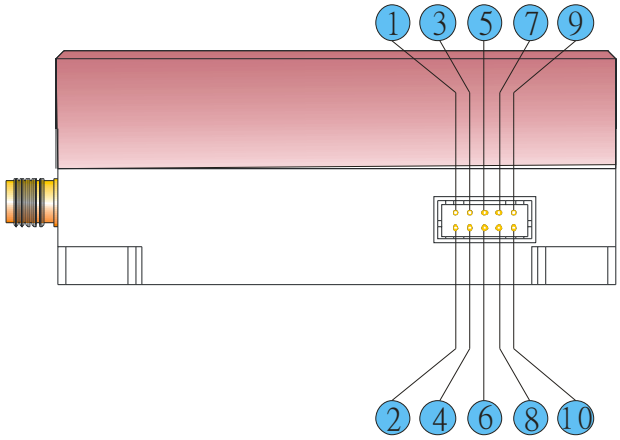


Figure 6 - GPIO PORT SCREW TERMINAL (FEMALE) – LOOKING AT READER

Note.
If FS-GM201 wants to receive data through GPIO, please connect to PIN2 and PIN4. Please add the 4k7 electric resistances, the limitation of voltage is from 12V to 24V and the limitation of Watt is above 5W.

If F-GM201 wants to transmit signal to other device, please connect to the device which is below 48V and 10mA.

CHAPTER 2

Reader Hardware Installation and Operation

This chapter describes the RFID Reader and provides installation and operation information.

Receiving the RFID Reader

Your RFID Reader Kit is shipped with the items listed below. Please verify the contents of your received shipment before assembling.

- RFID Reader
- Power supply and cables (two sections: one attached, one detached)
- USB or RS-232 reader-to-PC cable, or Ethernet Cable
- CD-ROM containing demonstration software, user guides and documentation

Figure 7 - FS-GM201 Developer's Kit

Reader I/O Panel

The I/O panel (shown below) houses the following:

- 4-pin female I/O terminal block.
- USB port, or 9-pin D female RS-232 serial port, or LAN TCP/IP port.
- Power connector.

Figure 8 - FS-GM201 Reader Connections (GPIO Connector)

Figure 9 - FS-GM201 Reader Connections (Power Connector & Mini-USB Connector)

Diagnostic LEDs

The FS-GM201 includes diagnostic LEDs on the face of the reader to provide easy and convenient external indication for various operating conditions:

- **POWER (green)** – indicates power is applied to the reader.
- **CRC Correct (yellow)** – indicates that the reader is receiving data from a tag.
- **CRC Error (red)** – indicates a fault condition with the reader.

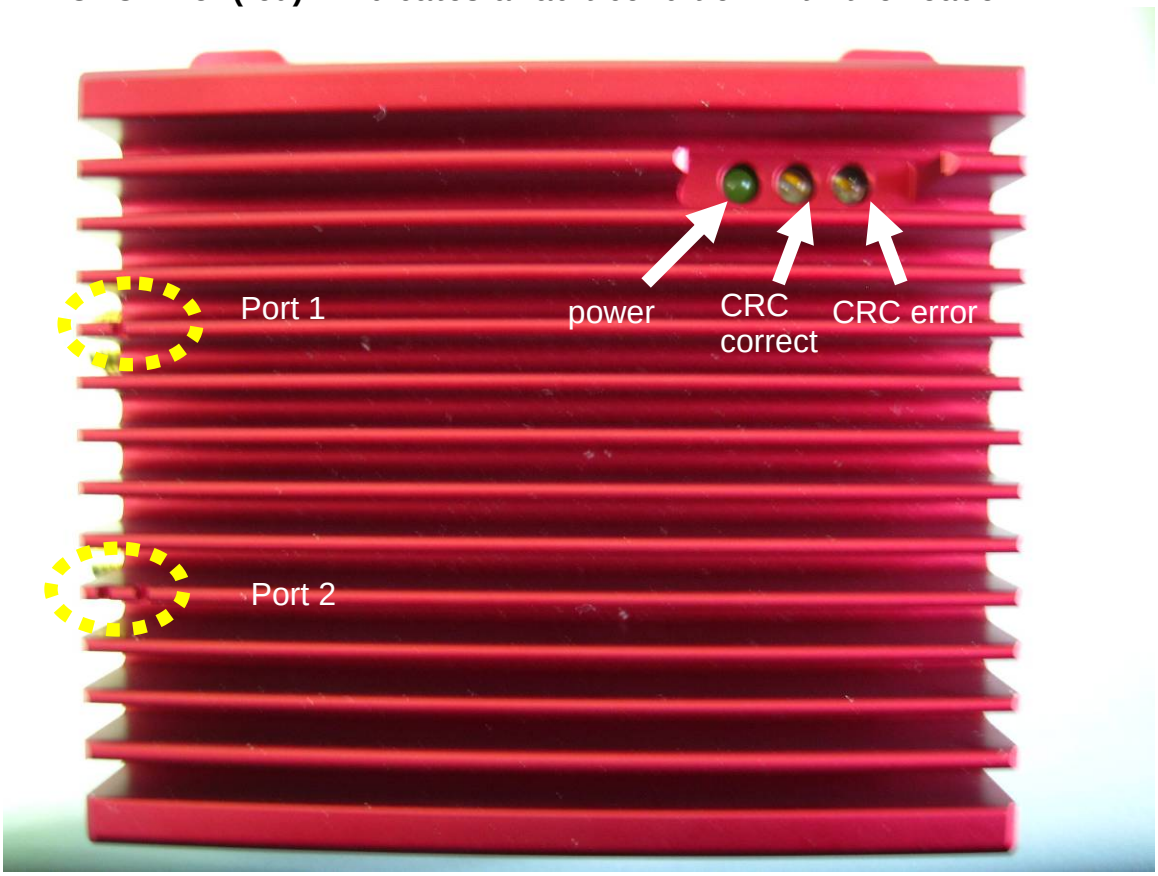


Figure 10 – FS-GM201 Reader Diagnostic LEDs

Antenna Panel

The antenna panel (opposite the reader's I/O panel) contains two coax antenna connector ports as shown below. These are SMA connectors.

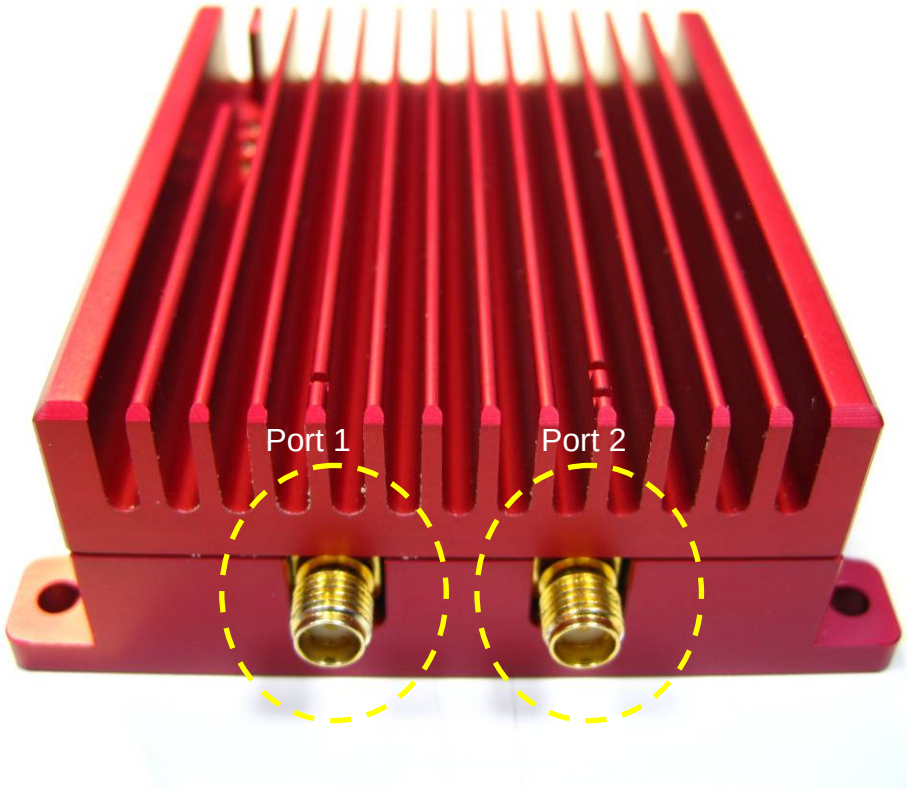


Figure 11 - Antenna Connections

System Assembly and Bench Test

Assembling the RFID Reader system is easy. We recommend you set up the system and verify its operation in a bench test configuration (shown below) before installing it in a production setting.

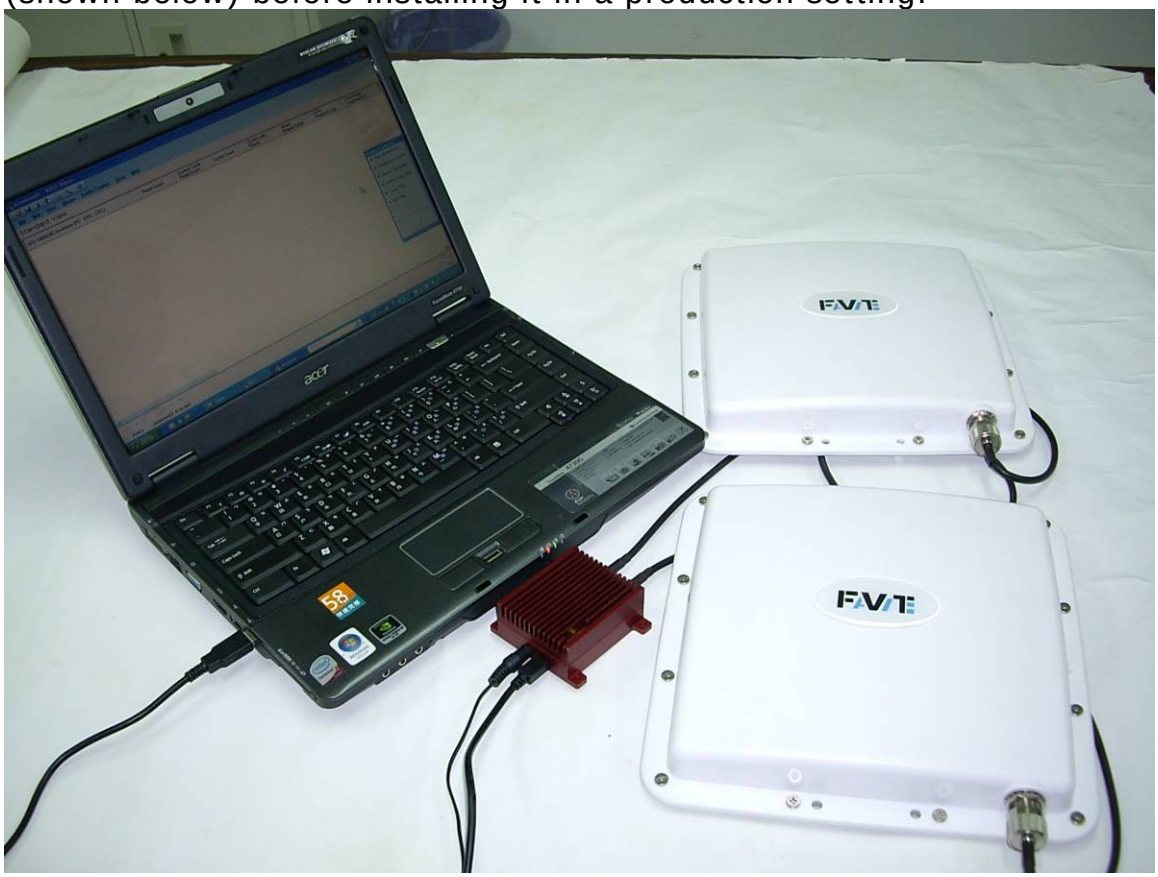


Figure 12 - Typical Bench Test Setup

Bench Test Configuration

1. Place the Reader on a tabletop.

Ensure the following conditions:A standard 110 or 220 VAC outlet is nearby.

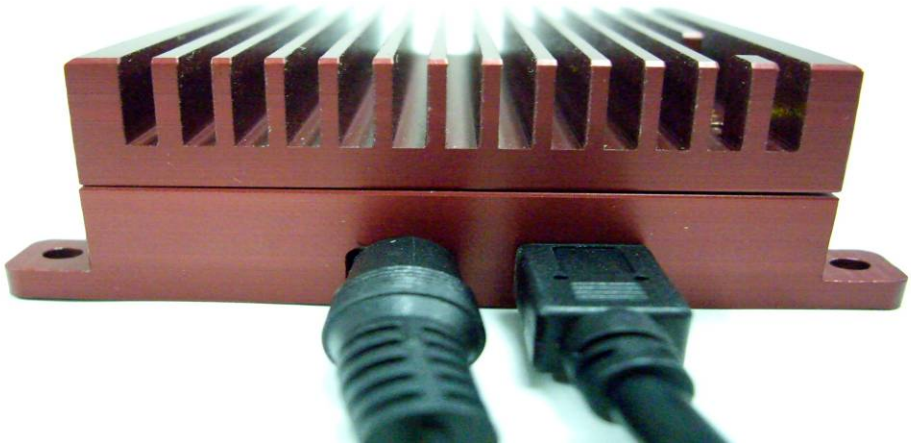


Figure 13– USB, RS-232, and Power Connections

Sufficient space is available on the tabletop for the reader and antenna.

2. Connect the USB, or RS-232 cable to the reader.

Align the male cable connector so that its shape and pins match the shape and holes of the female USB port or RS-232 port. (Connector Type are both mini-USB Connectors)

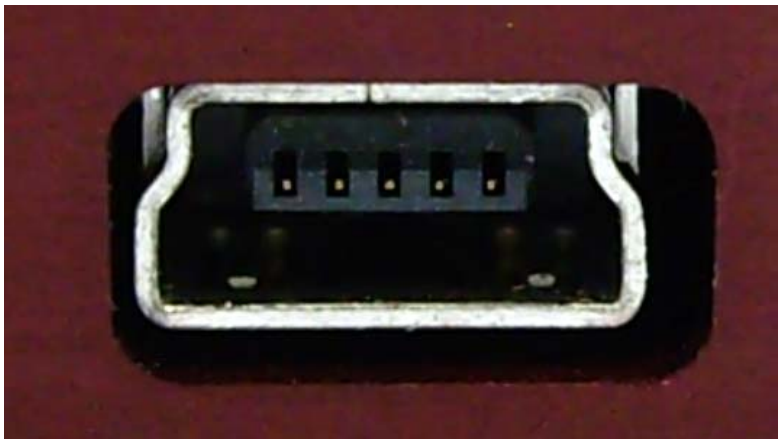


Figure 14 – USB or RS-232 Connector (mini-USB Connector)

Push the aligned connector into the port. Finger-tighten the screws to secure the cable/connector to the reader.

3. The difference between USB and RS-232 module.

- The color of heat sink is different.

Figure 15 – The color of USB mode is red.

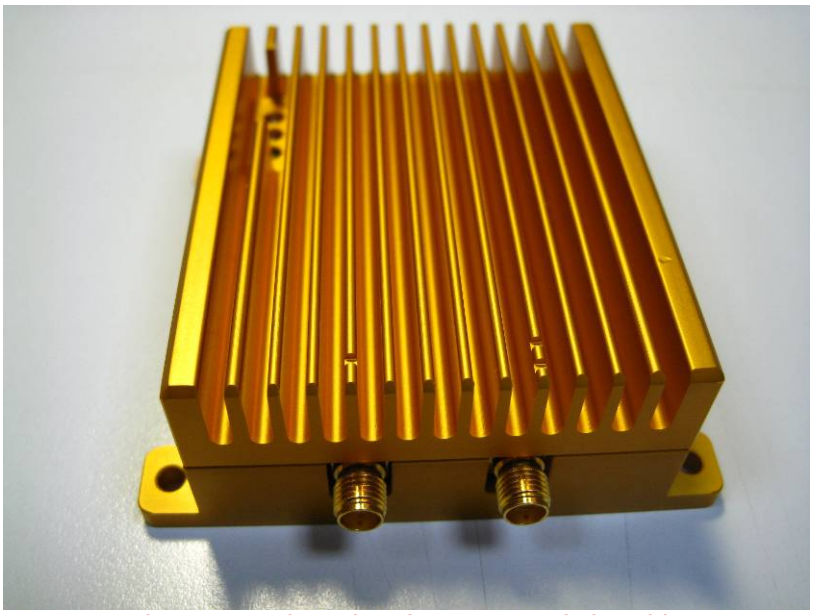


Figure 16 – The color of RS-232 mode is gold.

- The Chip on the daughter board is different.

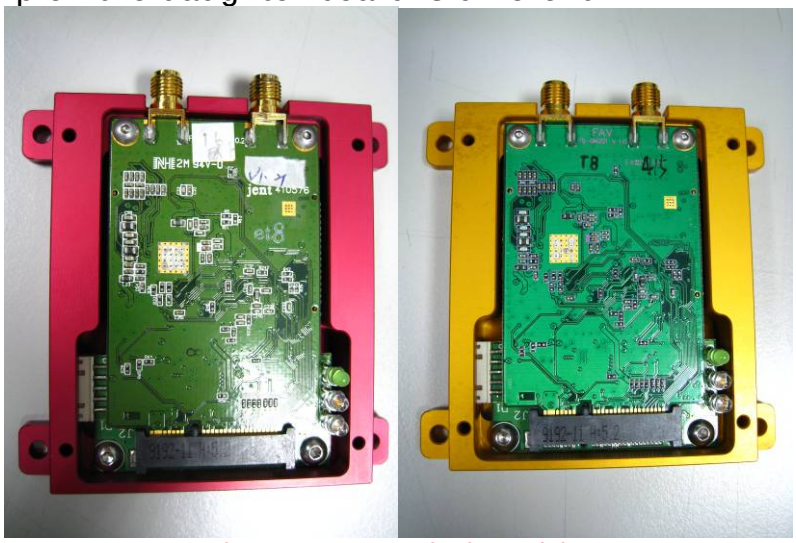


Figure 17 – Open the heat sink.

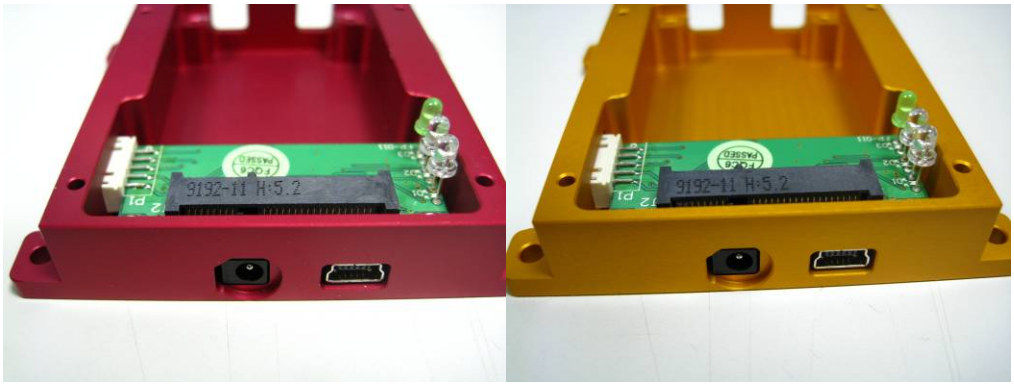


Figure 18 – Remove the mother board.

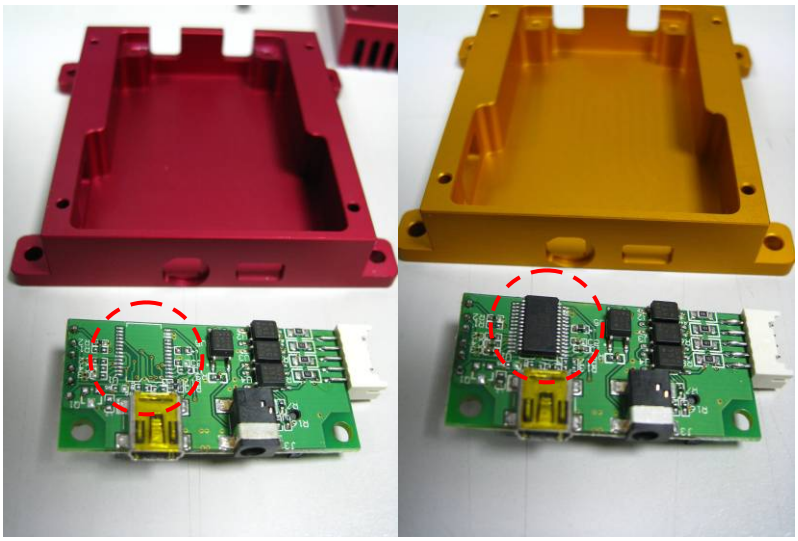


Figure 19 – RS232 has MCU chip on the daughter board, but USB doesn't.

- The cable is different.

Figure 20 –Connect with USB cable

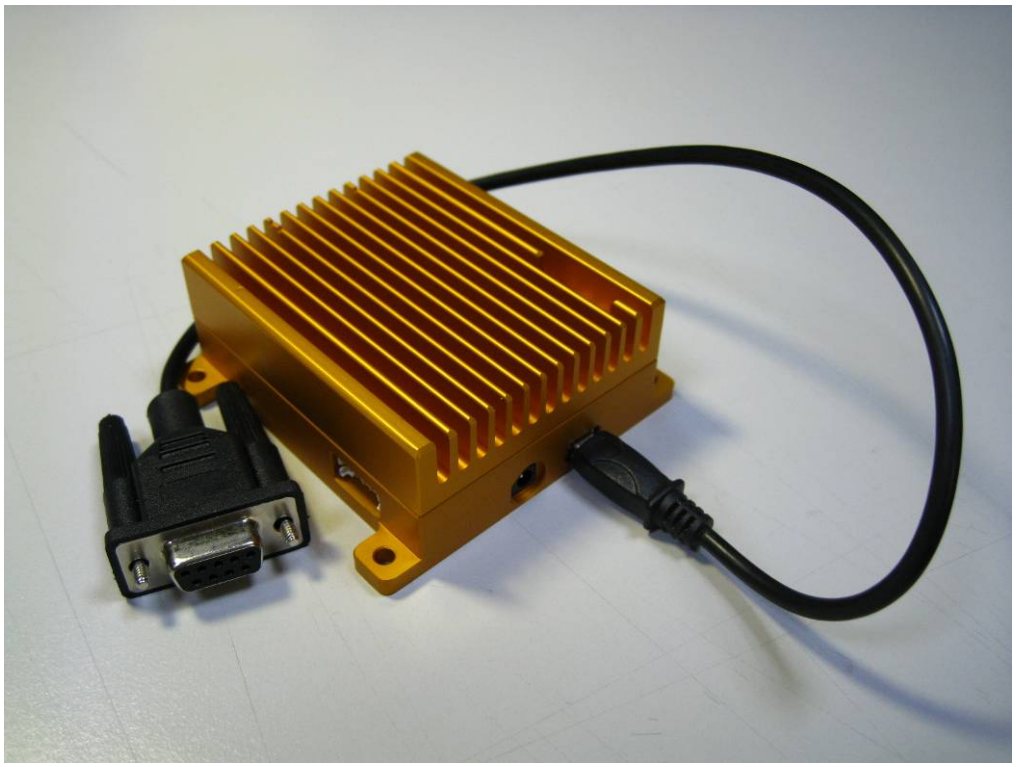


Figure 21 –Connect with RS-232 cable

4. RS-232 Configuration

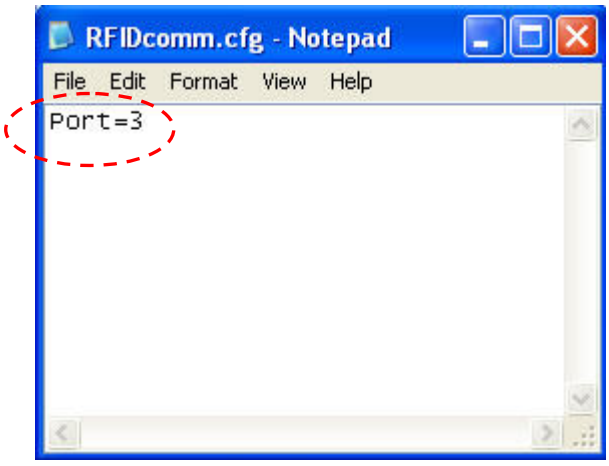
4.1 RS-232 Configuration with C++ base SDK

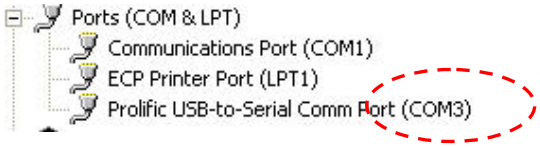
- After install the demo application like “RFID Reader Controller”, you will find the item on the desktop.

- Please double click it and you will see the illustration like this.

- Add a new “New Text Document.txt” file and name it to “RFIDcomm.cfg”.

- Open the file”RFIDcomm.cfg” with NotePad or any kind of editor software and input “Port=3”. (The port number will depend on which COM port does user connect. PS. User could see which COM Port is connected in control panel)





- That's all before executing the demo application "RFID Reader Controller" when the reader module connects with UART/RS-232.

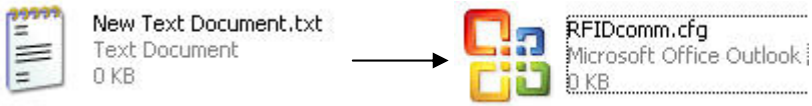
Note. The maxima of COM port is 9. If the COM Port is above 10, the FS-GM201's firmware would not work.

4.2 RS-232 Configuration with C# .Net base SDK

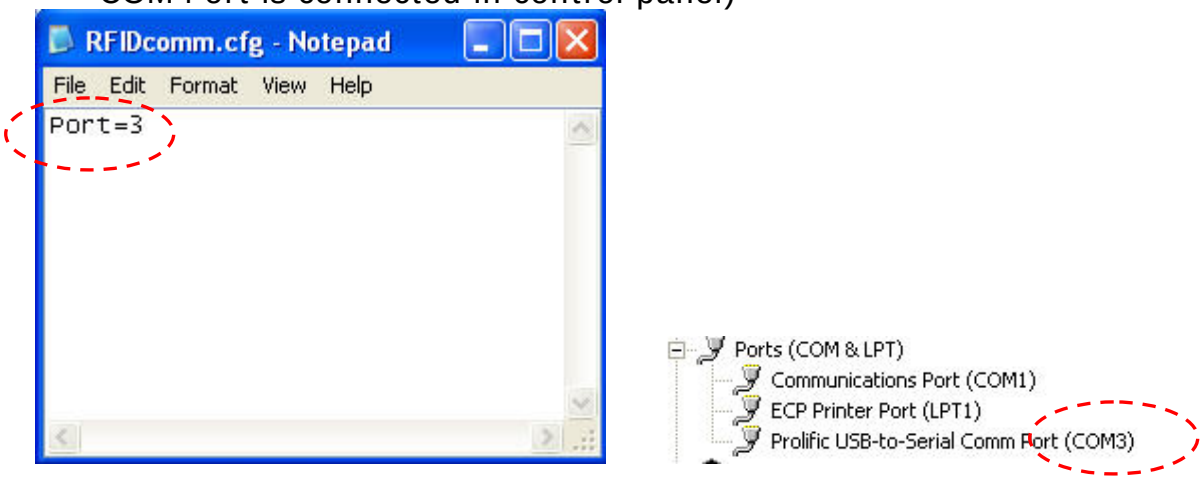
- After install the demo application like "FavSharp", you will find the item on the desktop.

- Please double click it and you will see the illustration like this.

- Add a new “New Text Document.txt” file and name it to “RFIDcomm.cfg”.



- Open the file”RFIDcomm.cfg” with NotePad or any kind of editor software and input “Port=3”. (The port number will depend on which COM port does user connect. PS. User could see which COM Port is connected in control panel)

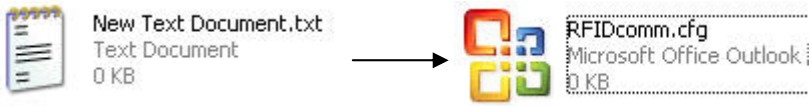


- That’s all before executing the demo application “FavSharp.exe” when the reader module connects with UART/RS-232.

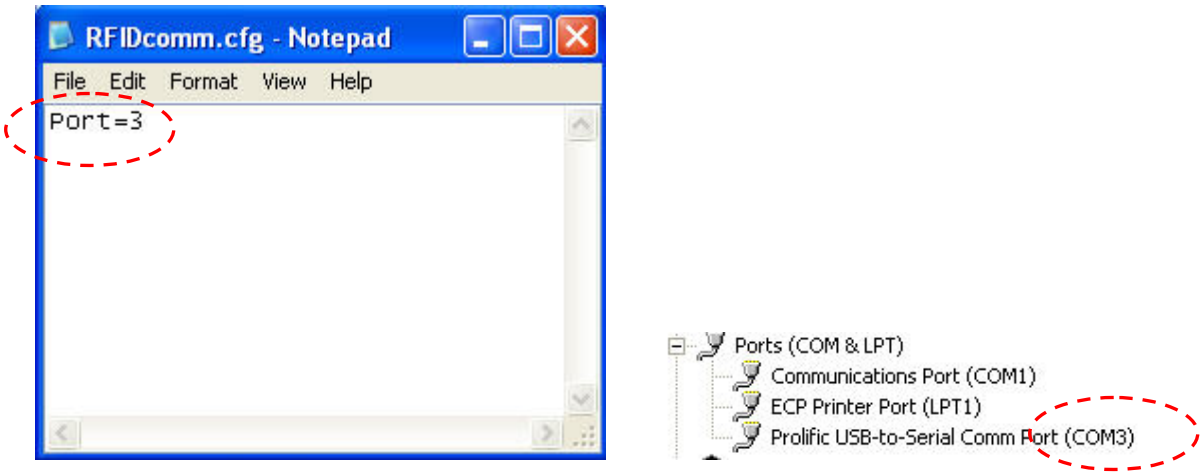
Note. The maxima of COM port is 9. If the COM Port is above 10, the FS-GM201’s firmware would not work.

4.3 RS-232 Configuration with Java base SDK

- Add a new “New Text Document.txt” file and name it to “RFIDcomm.cfg” in the folder “\FavJR_20091116_ver.1.0.0\FavJLib” or “\FavJR_20091116_ver.1.0.0\FavJR”.



- Open the file”RFIDcomm.cfg” with NotePad or any kind of editor software and input “Port=3”. (The port number will depend on which COM port does user connect. PS. User could see which COM Port is connected in control panel)



- That's all before executing the demo application "RFID Reader Controller" when the reader module connects with UART/RS-232.

Note. The maxima of COM port is 9. If the COM Port is above 10, the FS-GM201's firmware would not work.
Note. If FS-GM201 uses USB connector, the configuration above is unnecessary.

5. Connect the power supply to the reader.

Using the power cable attached to power supply, push the connector into the port until it is securely seated. When the power supply is connected, the green LED will turn on like the figure 15 below.

Figure 22 –Connect to power supply

6. Connect the coaxial cable to antenna port.

Antenna port 1 is on the top right side, if viewing the reader from the

front with the flange side down. The FS-GM201 has two antenna ports. If using the Favite demo application, please note that ANT 1 is selected by default when first initialized. If user choice the mono-static mode, that means FS-GM201 could available to transmit and receive radio frequency data with one antenna.
Antenna must be connected before turn on the radio power. If not, the power amplify might be burned and out of work.

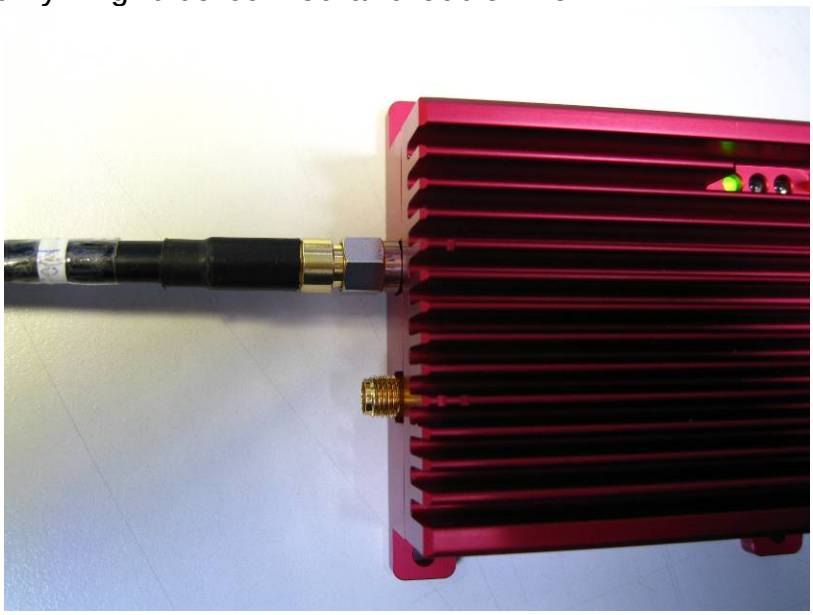


Figure 23 –Connect to cable

Note.
Antennas must be connected in pairs (one to transmit, one to receive) when FS-GM201 is set for bi-static mode. At this time, the reader pairs antenna 1 with port 1, and antenna 2 with port 2. This means that when antenna 1 is the active (transmit) antenna, antenna 2 will be the receiver.

7. Ensure the PC has compatible with USB driver.

In order for you to be able to connect to the reader with USB driver, the host PC must install the USB driver when connects to the reader at first time. The USB driver is in the folder \\FAV SDK\USB\Drivers and SDK\Windows\intel_rfid_sdk\drivers\winxp.

You are now ready to launch the test or demonstrate the RFID Reader Module FS-GM201.

8. Demonstration Software Guide

Please see the document “Favite RFID Reader Controller User Guide”, “Favite RFID Demo API User Guide” or “Favite RFID Java Demo API User Guide” in the folder \USB\SDK C++ base\Document, \USB\C Sharp\Document or \FavJR_20091116_ver.1.0.0\ Document